

Dymola

Dynamic Modeling Laboratory

Dymola Release Notes

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Document version: 1

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1 Important notes on Dymola

Installation on Windows

To translate models you must also install a supported Microsoft Visual Studio C++ compiler. The compiler is not distributed with Dymola. Note that **free** Microsoft compiler versions earlier than Microsoft Visual Studio Express 2008 are not supported (concerning **full** versions, some earlier versions are supported). Refer to section “Hardware requirements” on page 26 for more information.

Administrator privileges are required for installation.

2 About this booklet

This booklet covers Dymola 2014 FD01.

The disposition is similar to the one in Dymola User Manual Volume 1 and 2; the same main headings are being used (except for, e.g., Libraries and Documentation).

3 Dymola 2014 FD01

3.1 Introduction

3.1.1 Additions and improvements in Dymola

A number of improvements and additions have been implemented in Dymola 2014 FD01. In particular, Dymola 2014 FD01 provides

- Support for the new version 3.2.1 of the Modelica Standard Library (MSL). The new version is included in the distribution as the default MSL version (page 8).
- Full Modelica compliance (page 8).
- Extended FMI support (page 29).
 - FMU import on Linux.
 - Support of FMI 2.0 Release Candidate 1 (Limited Availability).
 - All Dymola solvers supported for FMU Co-Simulation export (Limited Availability).
- A new Modelica script editor (page 20).
- Improved presentations of messages of check/translation (page 13).
 - Number of errors, warnings and messages displayed.
 - Filtering of errors, warnings and messages supported.
 - Selected default initial conditions and selected continuous time states are displayed by default. They are displayed as expandable messages.
- Selected commands (built-in functions) available from the package browser (page 11).
- Plot features (page 18)
 - Second and higher-order harmonics available as signal operator.
 - Multiple select on plot curves.
- The Microsoft compiler Visual Studio 2012 is supported (page 24).
- Multiple conversions of libraries supported (page 11).
- Improved license handling; The user can define (page 25):
 - When Dymola should start to warn for license expiration.
 - If Dymola should start in Demo mode or terminate if the license is not found or invalid.
- dSPACE SCALEXIO support for Real-time simulation (e.g. Hardware-In-the-Loop Simulation) (page 28).
- New Java interface for Dymola (Limited Availability) (page 34).

3.1.2 New and updated libraries

New libraries

The following libraries are new:

- Fuel Cell Library, version 1.2.
- Heat Exchanger Library, version 1.0.1.
- Modelica_DeviceDrivers, version 1.2.
- Vapor Cycle Library, version 1.0.

For more information about the new libraries, please see section “New libraries” starting on page 34.

Updated libraries

The following libraries have been updated:

- Modelica Standard Library, version 3.2.1.
- Air Conditioning Library, version 1.8.6.
- Engine Dynamics Library, version 1.2.
- Electric Power Library, version 2.1.
- Flexible Bodies Library, version 2.1.
- Hydraulics Library, version 3.3.3.
- Hydro Power Library, version 2.3.
- Liquid Cooling Library, version 1.2.
- Modelica_LinarSystems2, version 2.3.1.
- Modelica_StateGraph2, version 2.0.2.
- Modelica_Synchronous Library, version 0.92.
- Optimization Library, version 2.2.1.
- Pneumatics Library, version 1.6.1.
- PowerTrain Library, version 2.2.1.
- Smart Electric Drives Library, version 1.4.4.
- Thermal Power Library, version 1.7.
- Vehicle Dynamics Library, version 1.8.
- Vehicle Interfaces Library, version 1.2.1.

For more information about the updated libraries, please see the section “Updated libraries” starting on page 37.

3.1.3 Limited Availability Features

This version of Dymola contains certain features which are labeled “Limited Availability” (LA). It means that the implementation might be partial, diagnostics partial, the testing is not complete, and no support/maintenance and only limited documentation is available.

However, we provide them to you as early as possible in order for you learn about these features, plan for later use, and be able to give us your feedback. You typically need to set some switch to enable them. These features are planned to become Generally Available (GA) in the Dymola 2015 release.

The LA features are briefly described below and are marked (LA).

3.2 Developing a model

3.2.1 New version of Modelica Standard Library available

By default Dymola will start with Modelica Standard Library (MSL) version 3.2.1 if installing Dymola for the first time.

Note! If the new version MSL 3.2.1 should be used as default version when earlier versions of Dymola have been used previously, do the following:

- Apply the command **Edit > Options...**, select the **Versions** tab, select Modelica version 3.2.1 and tick **Force upgrade of models to this version**.
- Save the above setting by selecting the tab **Save Settings**, tick **Default Modelica version**, and click **OK** to save the default version.

Concerning new features of this version, please see section “Modelica Standard Library (MSL)” on page 37.

Note! New initialization rules are applied. They can be disabled using a flag if needed. See section “Support of new initialization rules in Modelica” on page 34 for more information.

All libraries in the Dymola distribution support MSL 3.2.1.

3.2.2 Full Modelica Compliance

Dymola is fully Modelica compliant. A Modelica Compliance test suit for Modelica Language Specification version 3.2 revision 2 has been developed by Modelica Association. It consists of 1008 small models testing most of the features of the Modelica Language. Dymola compiles and simulates all of the 587 correct models. Dymola generates appropriate diagnostics for 402 of the 421 incorrect models (with pedantic flag set) – a large part of the missing diagnostics is related to enumerations.

Dymola also handles the synchronous language elements of Modelica Language Specification version 3.3. Furthermore, Dymola runs all 289 example models of the Modelica Standard Library version 3.2.1 and the 434 models of the Modelica Standard Library test suite. The other libraries shipped with Dymola consist of 676 executable models; and more than 6000 model components and 6000 functions.

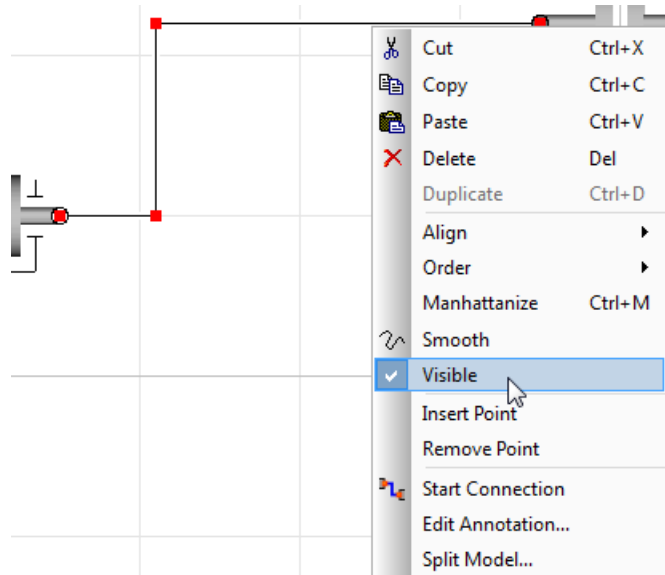
3.2.3 Improved presentation of check messages

The messages displayed in the **Translation** tab of the messages window are improved. See “Filtering of messages” on page 15.

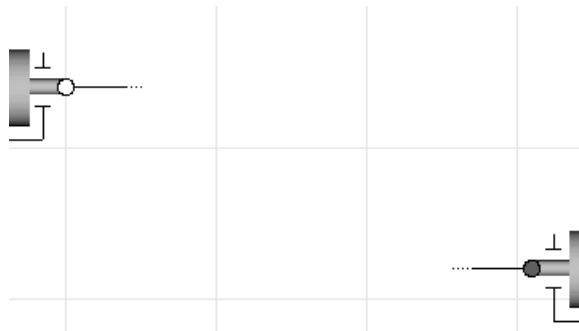
3.2.4 Hiding graphical connections

In Dymola 2014 FD01 the user can easily use the context menu to hide graphical connections, improving the display of the diagram layer.

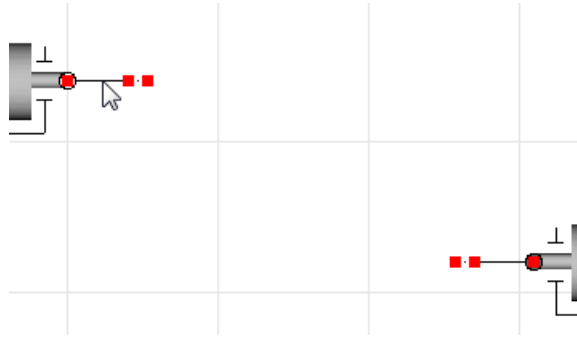
To use this feature, the user must set the flag `Advanced.InvisibleConnections=true`. The flag is by default false; the selection below is by default not shown in the context menu.



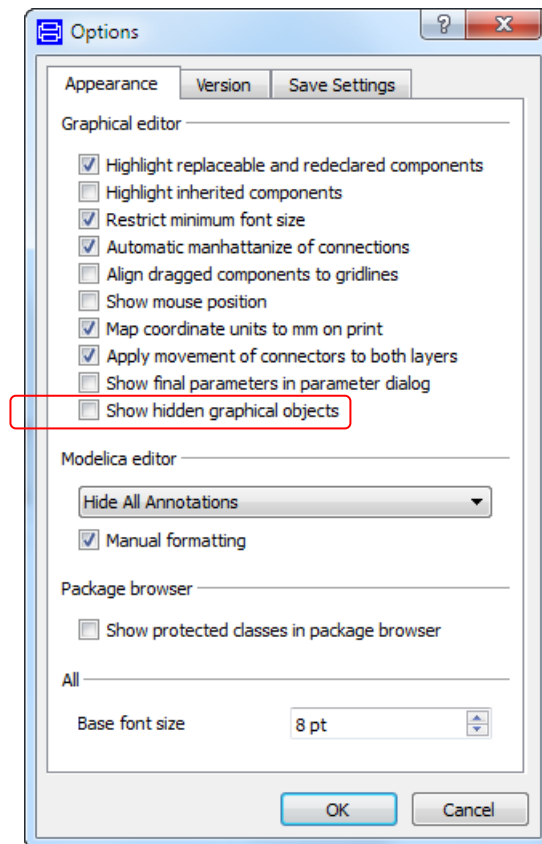
Unticking **Visible** will give the following:



Selecting one “stub” will also select the other:



Hidden graphical connections can easily be displayed by setting **Show hidden graphical objects** reached by the command **Edit > Options...**, in the **Appearance** tab. By default such objects are hidden.



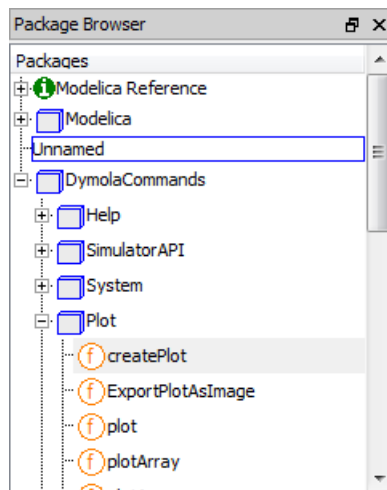
Accidental hiding is corrected using **Edit > Undo (Ctrl+Z)**.

3.2.5 Selected commands (built-in functions) available from the package browser

In Dymola 2014 FD01 selected commands (built-in functions) can be made available from the package browser or be reached by the context command **Insert Function Call...**. This enables convenient use in the Modelica Text editor by drag-and-drop.

To load the commands in the package browser, import the package DymolaCommands by typing `import DymolaCommands` in the command input line of the Commands window.

The selection and grouping of the commands are the same as in the Dymola User Manual Volume 1 (chapter “Simulating a model”, section “Scripting”, subsection “Built-in functions in Dymola”).



Note that since the commands now can be used by the context command **Insert Function Call...** the commands are available in a number of editors, e.g. Modelica Text editor as well as the new Script editor (page 20), if displayed in the package browser.

3.2.6 Multiple conversion of libraries supported

Dymola 2014 FD01 supports multiple conversions of libraries. A typical case is that a user does not upgrade to each new Dymola version, but “jumps” a certain version. When upgrading to the present Dymola version in this case, certain libraries may demand to be upgrading to the “jumped” version before upgrading to the present version. Dymola 2014 FD01 handles this by executing more than one upgrading script in the same operation.

An exception is if any intermediate library version requires manual conversion; which is handled by converting models to a deprecated library. This deprecated library may be missing in, or may be incompatible with, the newer Dymola version.

3.2.7 Minor improvements

Semi-transparent icons in dragging operations from package browser

When dragging classes from the package browser, the icons are now semi-transparent, to avoid hiding, e.g., text when dragging to the Modelica Text editor.

Default action “Change Class” when dragging a component from package browser on top of component in component browser

When dragging a component from the package browser on top of a component in the component browser, a Change Class action is performed by default if possible. When dragging a component between two components, the previous behavior displaying a menu of selectable actions is kept.

Improved icon rendering

Icon rendering has been improved in Dymola 2014 FD01.

- Polygons that specify they not have a border will not get a border-line drawn. This is most visible in the package browser.
- Splines will be anti-aliased in the package browser.

Adjustable maximum line length in the Modelica Text editor

A dotted vertical line has been added in the Modelica Text editor to indicate the maximum line length. It can be dragged to change the maximum line length; the user can then adapt to the new value by right-clicking in the Modelica text editor and select the command **Highlight Syntax**, or by the short command **Ctrl+L**.

Improved syntax error messages

The information in the syntax error messages has been improved, allowing the user to better understand the cause of the errors.

External links always opened in external web browser

In Dymola 2014 FD01, external links (http or https) in the documentation layer and other locations are always opened in an external web browser when activated.

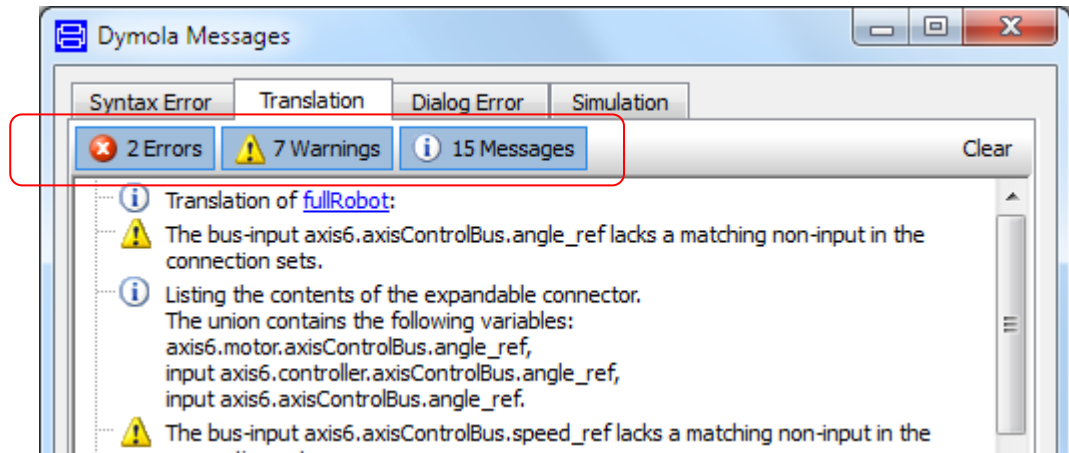
3.3 Simulating a model

3.3.1 Improved presentation of translation messages

The display and content of messages generated during translation has been improved. This information is displayed in the **Translation** tab of the messages window.

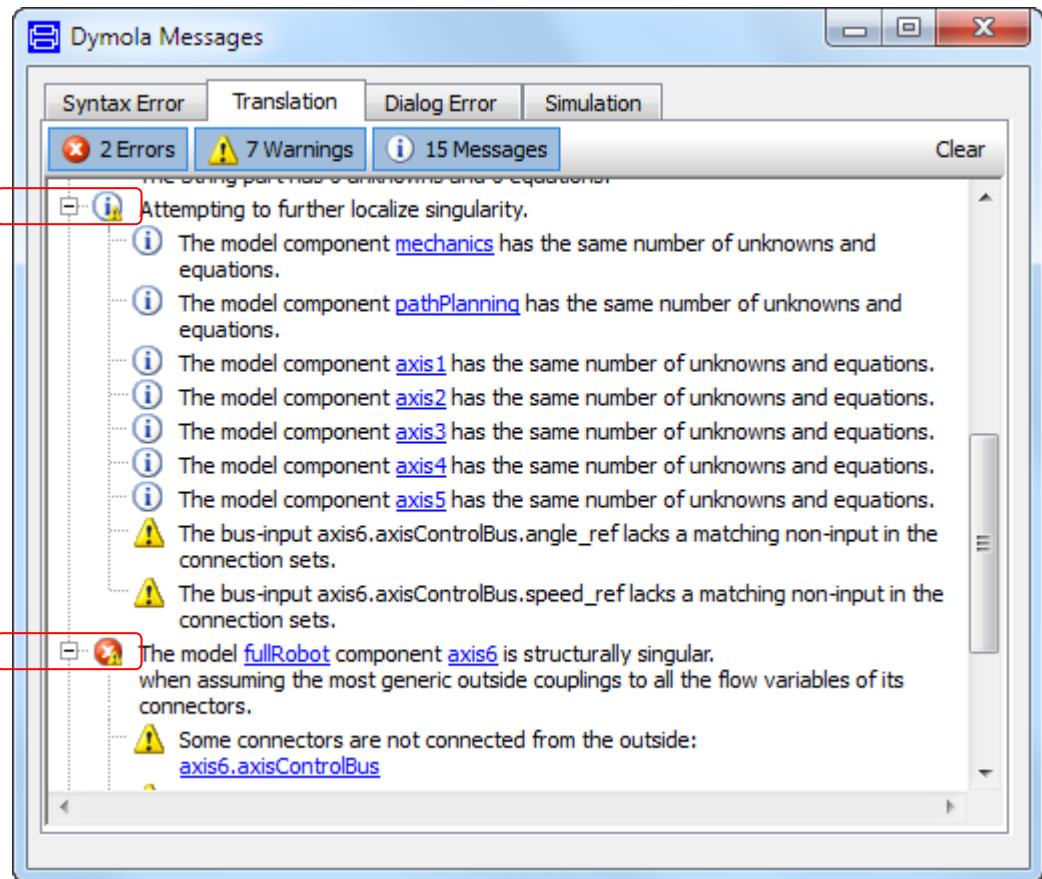
Number of errors, warnings and messages displayed

In Dymola 2014 FD01 the number of errors, warnings and messages are always displayed at the top of the messages window.



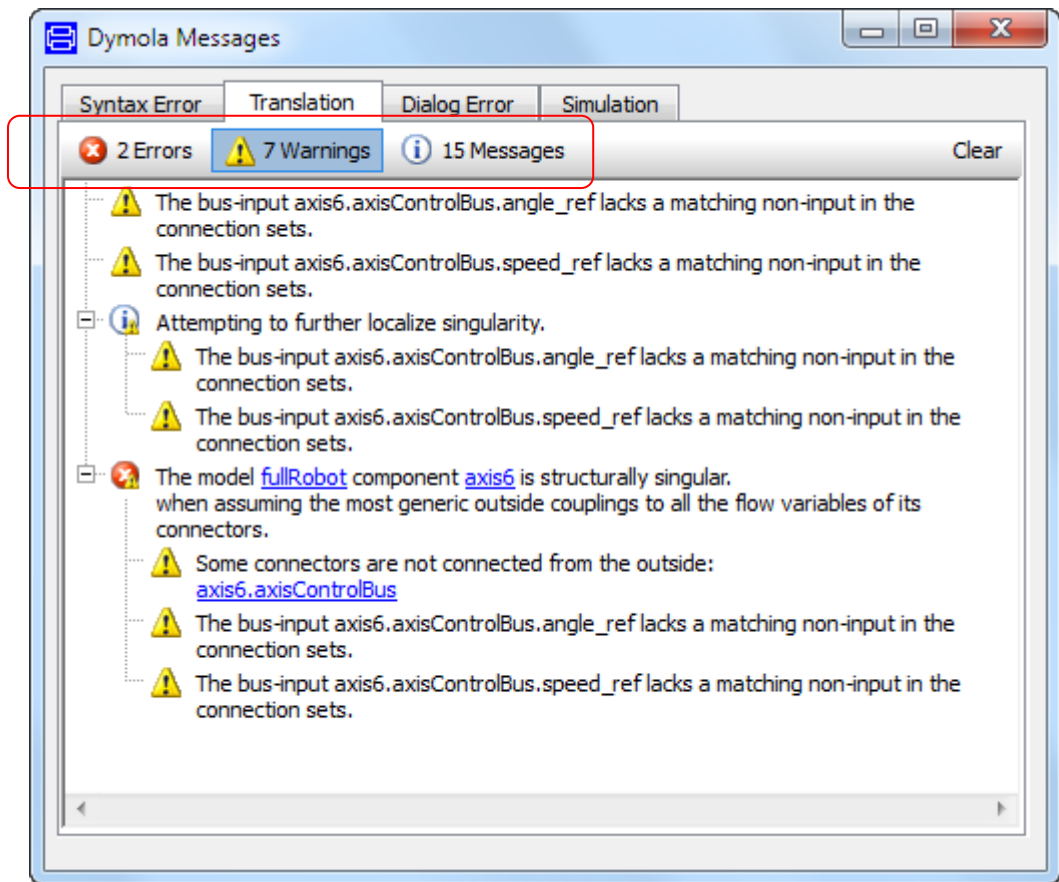
Subicons to indicate of other type than parent message

Dymola 2014 FD01 introduces subicons in parent icons to indicate that there exist submessages of other type than the parent message. This prevents missing submessages more severe than the parent message.



Filtering of messages

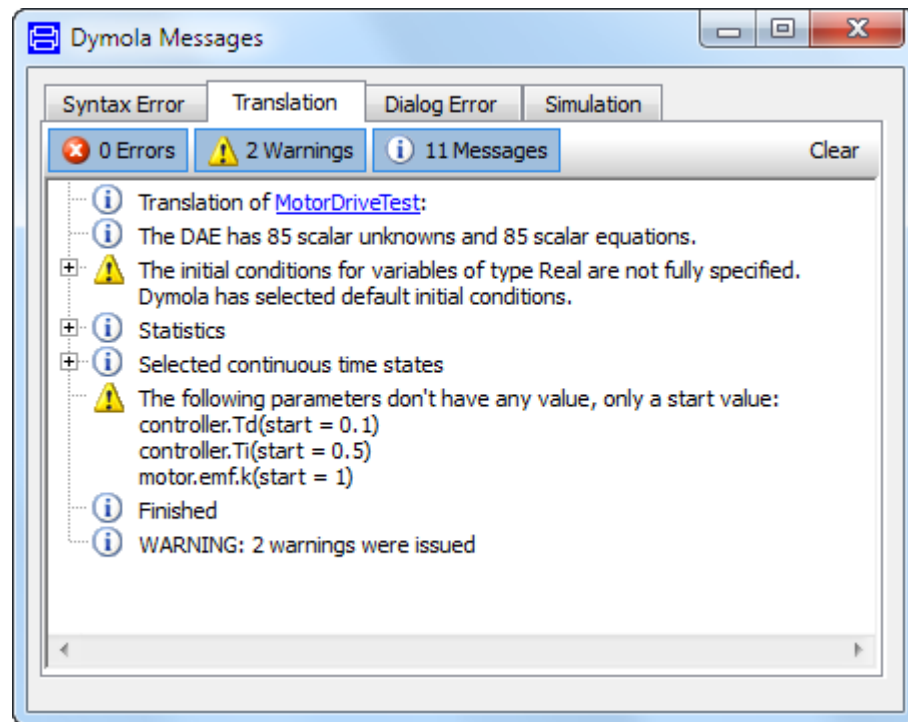
In Dymola 2014 FD01, messages can be filtered using three buttons. The above image shows all messages being presented. By clicking on the buttons the user can select what type of messages to filter. The picture below shows only warnings (compare with previous figure):



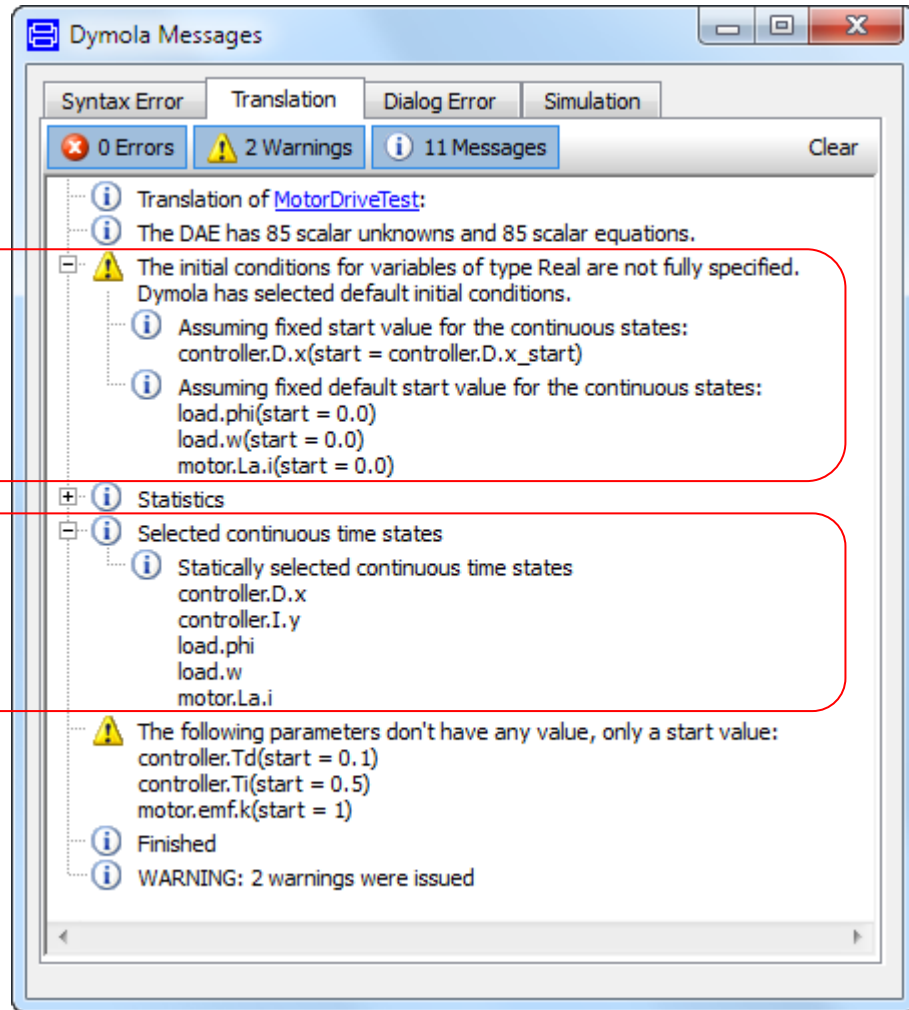
Note that the parent icons are also included since they contain warnings.

Presentation of selected default conditions and selected continuous-time states

Selected default conditions and selected continuous-time states are presented by default. The default setting of this window will display the following after translation of the demo Motor Drive (**File > Demos > Motor Drive**).



Expanding them in this example will display:



Clear log

The **Translation** tab can be erased by clicking the **Clear** button to the right in the header.

3.3.2 Opening of result files by drag-and-drop or double-clicking supported

You can open a .mat file (result file or Matlab file) either by dragging it into the Dymola main window, or by double-clicking it. To use double-clicking, .mat files must be associated to Dymola.

Dymola will enter Simulation mode when performing any of these actions.

3.3.3 Plot window

Signal operators: additions and improvements

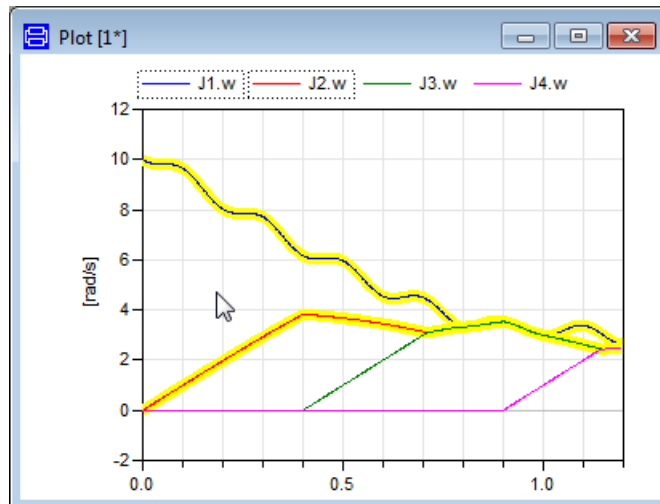
Second and higher-order harmonics available as signal operator

Second and higher-order harmonics are available using the built-in function `plotSignalOperatorHarmonic`, by giving the input parameter `harmonicNo` values larger than 1 (1 correspond to first harmonic).

Multiple select on plot curves

In Dymola 2014 FD01 it is possible to select more than one curve in a plot window. A curve is selected by clicking either on the curve or its legend. To deselect, the curve/legend can be clicked again.

Selected curves are marked with yellow highlight.



To clear the selection, you can click the background.

If right-clicking a curve and selecting **Copy** from the context menu, all selected curves will be copied to a tab-separated list with one column per curve. The first column contains the x-value, normally time.

	A	B	C	D
1	Time	J1.w	J2.w	
2	0	10	0	
3	0.0024	9.976903915	0.023999976	
4	0.0048	9.955610275	0.047999769	
5	0.0072	9.936098099	0.071999133	
6	0.0096	9.91834259	0.095997863	
7	0.012	9.902309418	0.11999578	
8	0.0144	9.887956619	0.143992677	
9	0.0168	9.875232697	0.16798833	
10	0.0192	9.864061356	0.191982538	
11	0.0216	9.854390144	0.215975091	
12	0.024	9.846124649	0.239965752	

3.3.4 Animation window

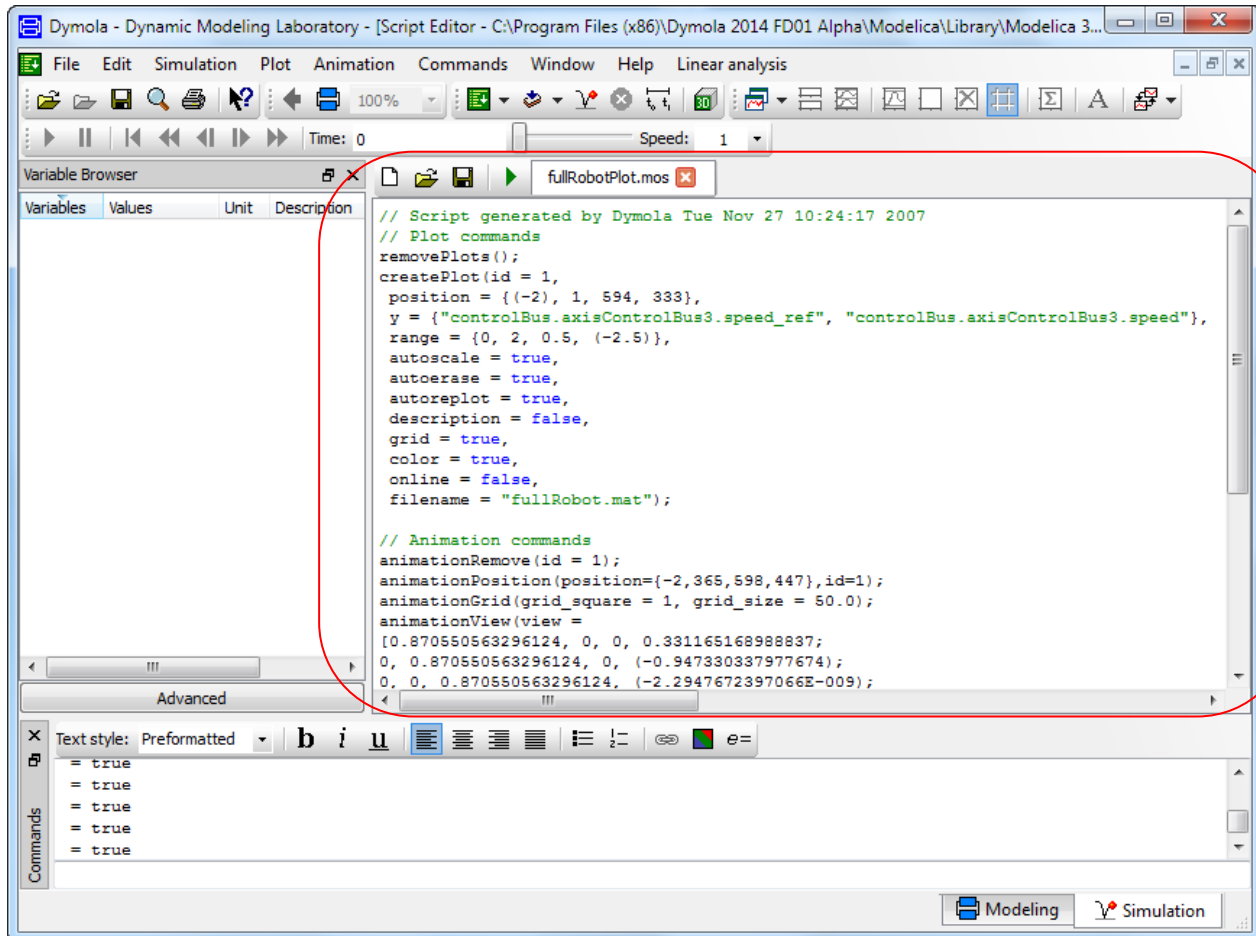
Improved rendering of surfaces in animation

In Dymola 2014 FD01, the support for color fields of surfaces in animation has been improved. Furthermore, the smoothness of surfaces is also better rendered. This will improve e. g. presentation and animation of temperature and pressure in the Power Train library.

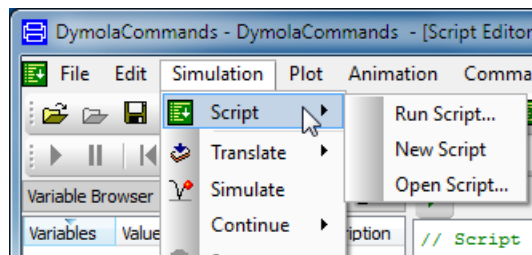
3.3.5 Scripting

A new Modelica script editor

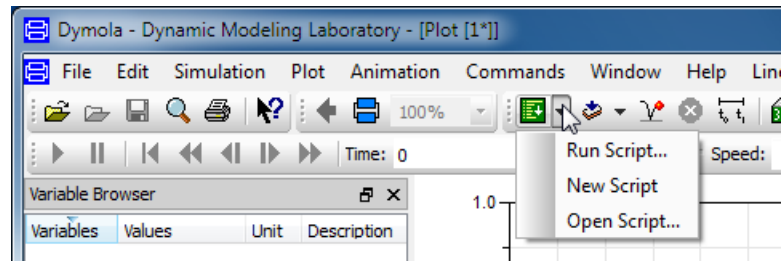
A new Modelica script editor is available in Dymola 2014 FD01.



Accessing the script editor

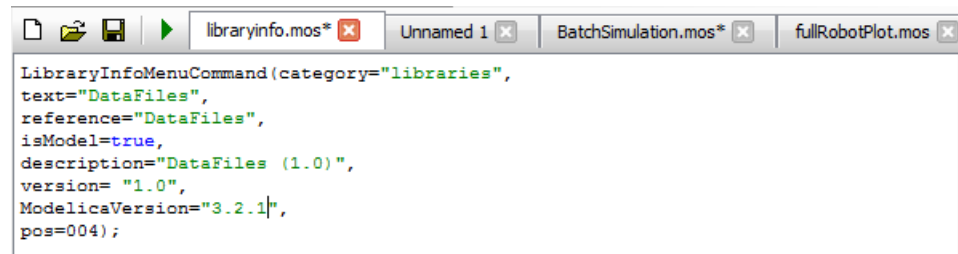


The commands **Simulation > Commands > New Script** or **Simulation > Commands > Open Script...** will open the script editor. The commands are also available as selections from the **Run Script** button:



Handling several scripts in the script editor

Several scripts can be open simultaneously. They will be displayed as tabs in the script editor. Below four scripts are present in the script editor.



Clicking the **New Script** button in the script editor header will open a new empty script (in the above example Unnamed 2 since an Unnamed 1 is already present).

Clicking the **Open Script** button will display a dialog for browsing for an existing script.

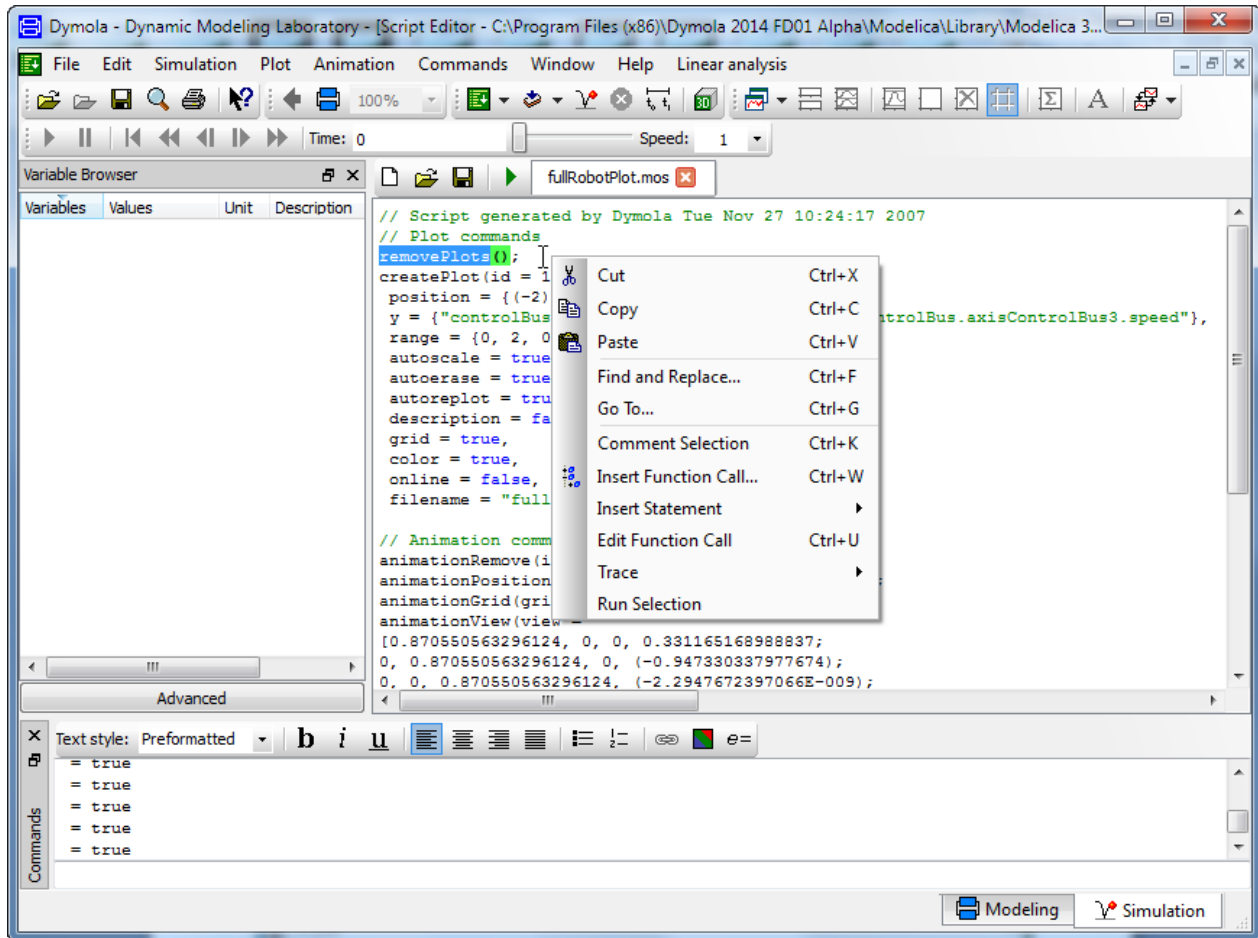
Clicking the **Save Script** button will display a dialog for saving the script.

Scripts can be closed by clicking on the cross in the corresponding tab.

Editing scripts using the script editor

A script that has been edited is marked by a star in the tab. See the figure above for examples.

A context menu is available by right-clicking in the editor:



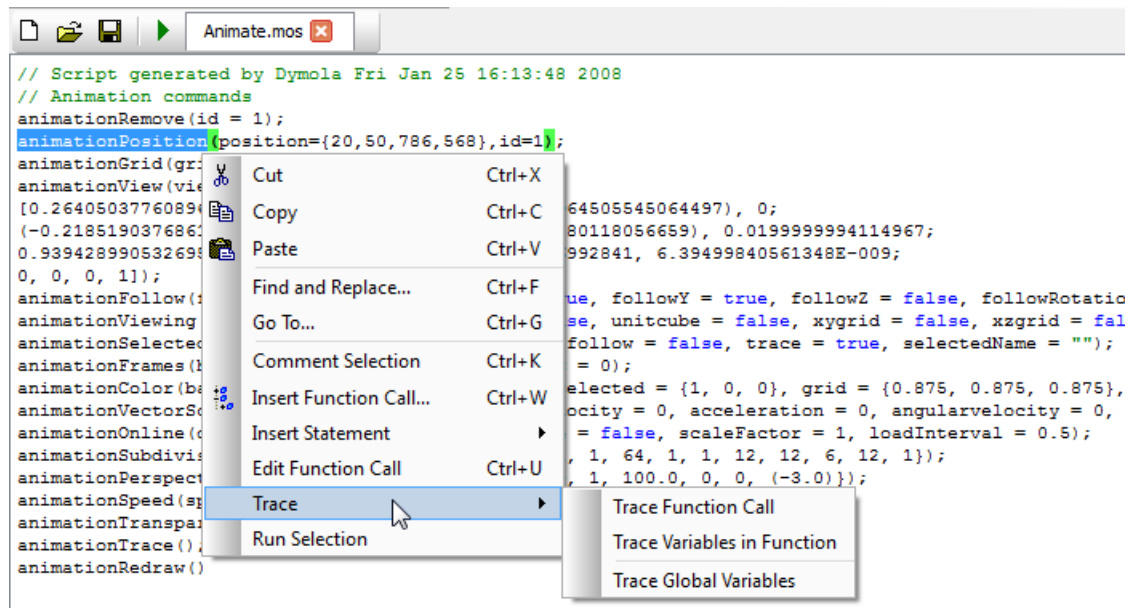
The commands for editing correspond to the commands in the Modelica Text editor.

Tracing

Function calls, variables in functions and global variables can be traced when executing the script.

Tracing of global variables is always accessible by right-clicking the script editor and selecting **Trace > Trace Global Variables**.

To trace a function call or the variables in a function, the function call has to be selected by double-clicking the name before taking up the context menu and selecting **Trace > Trace Function Call** or **Trace > Trace Variables in Function**.



The trace output is displayed in the command log.

Executing a script from the script editor

The active script can be executed by clicking the **Run Script** button in the header of the script editor.

Executing a selected part of a script

Right-clicking a selected part of a script, enables the command **Run Selection**. This command will execute the selected part of the script as would it be a separate script.

New command (built-in function)

The following command (built-in function) is new in Dymola 2014 FD01:

Function	Description
getLastError	"Returns the last error message from the last command. If the last command was successful an empty string is returned. For check, translate, etc, the log is returned."

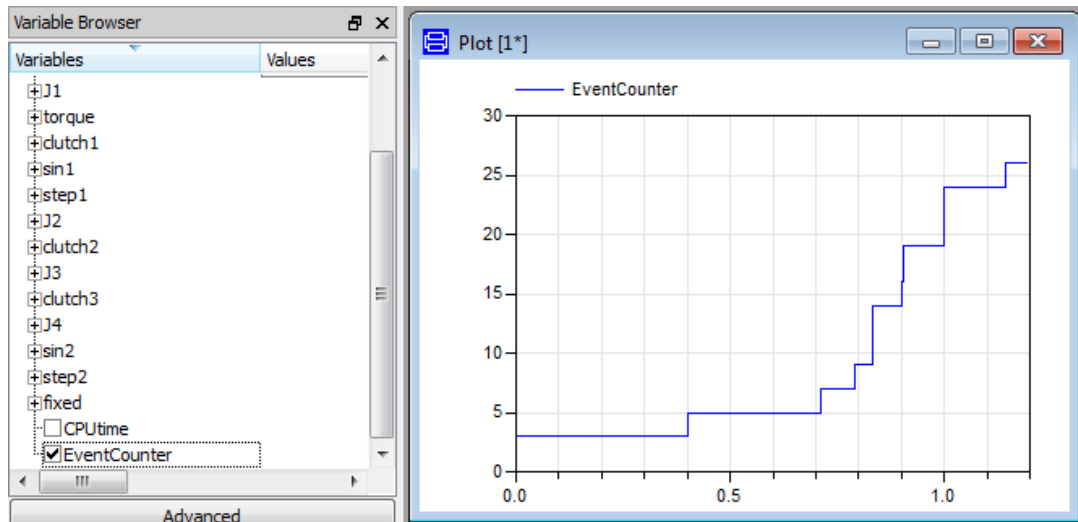
3.3.6 Minor improvements

Export command in variable browser improved

The previous context command for a result file in the variable browser, **Save Result As...** has been renamed to **Export Result As....** Also, this improved command does not change any name of result files in the variable browser when used.

Simulation events available for plotting

In Dymola 2014 FD01 simulation events are available in the simulation results by ticking the setting **Include a variable for elapsed CPU time during simulation**. The setting is available by the command **Simulation > Setup...**, the **Translation** tab. The below example is from the demo Coupled Clutches:



External links always opened in external web browser

In Dymola 2014 FD01, external links (http or https) in the documentation layer and other locations are always opened in an external web browser when activated.

3.4 Installation

3.4.1 Installation on Windows

Compilers

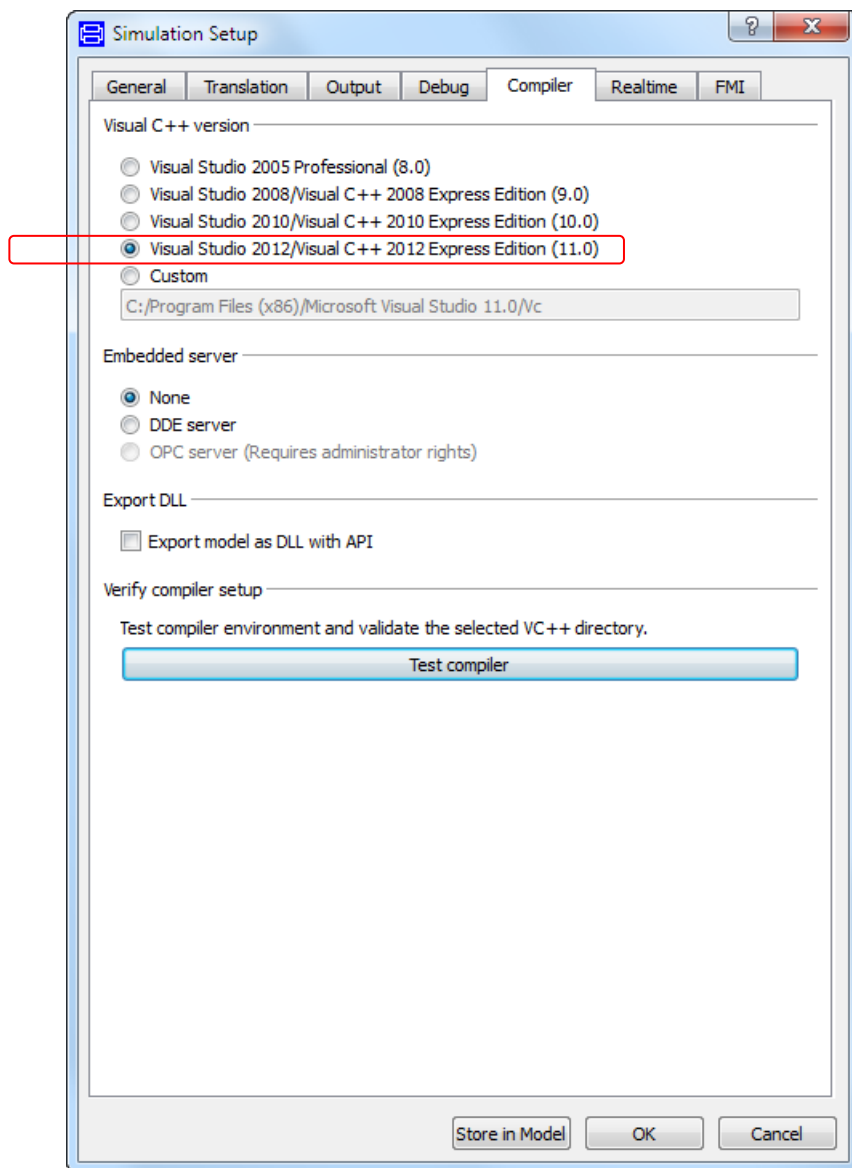
New compiler supported

The new compiler Microsoft Visual Studio C++ 2012 is now supported, both the Professional edition and the Express edition.

To download the free Express edition, the link

www.microsoft.com/visualstudio/eng/downloads

can be used. Note that you need administrator rights to install the compiler.



3.4.2 New command line argument available for license handling

A new command line argument is available in Windows and Linux for controlling

- When Dymola should start to warn that the license will be expiring.
- If Dymola should start in Demo mode if the license is not found or invalid.

The default is that Dymola start to warn 30 days before the license is expiring, and starts in demo mode if the license is not found or invalid.

Consider a user wanting to have the first warning 5 days before the license is expiring, and wanting to terminate Dymola if the license is not found or invalid. Assuming a 32-bit Windows computer with Dymola at default location, Dymola could be started with the following command line using the Command Prompt in Windows:

```
"C:\Program Files\Dymola 2014 FD01\bin\Dymola.exe" /days -5
```

The value (5) controls how many days that should be left to expiration when warning, and the minus before the value is added if Dymola should terminate if the license is not found or invalid.

“-” can be used instead of “/”; the example above will then be:

```
"C:\Program Files\Dymola 2014 FD01\bin\Dymola.exe" -days -5
```

1 day is the minimum start time for warning of license expiration; the warning cannot be completely disabled.

3.4.3 Hardware requirements and recommendations

Hardware requirements

- At least 1 GB RAM
- At least 400 MB disc space

Hardware recommendations

At present, it is recommended to have a system with an Intel Core 2 Duo processor or better, with at least 2 MB of L2 cache. Memory speed and cache size are key parameters to achieve maximum simulation performance.

A dual processor will be enough; the simulation itself uses only one execution thread so there is no need for a “quad” processor.

Memory size may be significant for translating big models and plotting large result files, but the simulation itself does not require so much memory. Recommended memory size is 2-4 GB of RAM for 32-bit architecture and 3-6 GB of RAM for 64-bit architecture.

3.4.4 Software requirements

Microsoft Windows

Dymola versions on Windows and Windows operating systems versions

Dymola 2014 FD01 is supported, as 32- and 64-bit application, on Microsoft Windows XP, Windows Vista and Windows 7. Since Dymola does not use any features supported only by specific editions of Windows (“Home”, “Professional”, “Enterprise” etc.), all such editions are supported if the main version is supported.

Compilers

Please note that for the Windows platform, a Microsoft C/C++ compiler must be installed separately. The following compilers are supported for Dymola 2014 FD01 on Windows:

Free editions:

- Visual Studio 2008 Express Edition (9.0)
- Visual C++ 2010 Express (10.0)
- Visual Studio 2012 Express Edition (11.0)

Professional editions:

- Visual Studio 2005 (8.0)
- Visual Studio 2008 (9.0)
- Visual Studio 2010 (10.0)
- Visual Studio 2012 (11.0)

Dymola license server

For a Dymola license server on Windows, all files needed to set up and run a Dymola license server on Windows, except the license file, are available in the Dymola distribution. (This includes also the license daemon, where Dymola presently supports FLEXnet Publisher version 11.9 or later. A recent version is part of the Dymola distribution.)

Linux

Dymola versions on Linux and operating system versions, and compiler

Dymola 2014 FD01 is supported on Red Hat Enterprise Linux 5.1 with gcc version 4.1.2, and compatible systems (32-bit).

There is no native Dymola 64-bit application for Linux.

Note on Optimization library

Please note that you have to use the Optimization library version 2.x or higher to use multi-criteria design optimization on Linux; the older Design.Optimization package does not support multi-criteria design optimization on Linux.

Dymola license server

For a Dymola license server on Linux, all files needed to set up and run a Dymola license server on Linux, except the license file, are available in the Dymola distribution. (This also includes the license daemon, where Dymola presently supports FLEXnet Publisher version 11.9 or later. A recent version is part of the Dymola distribution.)

3.5 Other Simulation Environments

3.5.1 Dymola – Matlab interface

Compatibility

The Dymola – Simulink interface now supports Matlab releases from R2008a (ver. 7.6) up to R2013a (ver. 8.1). Only Visual Studio C++ compilers are supported to generate the DymolaBlock S-function. The LCC compiler is not supported.

3.5.2 Real-time simulation

dSPACE SCALEXIO support

In addition to the previously supported hardware platforms DS1005 and DS1006, Dymola 2014 FD01 now also introduces support for the SCALEXIO platform.

Compatibility – dSPACE

Dymola 2014 FD01 generated code has been verified for compatibility with the following combinations of dSPACE and Matlab releases.

dSPACE DS1005 and DS1006 platforms

- dSPACE Release 6.2 with Matlab R2008a
- dSPACE Release 6.3 with Matlab R2008b
- dSPACE Release 6.4 with Matlab R2009a
- dSPACE Release 6.6 with Matlab R2010a
- dSPACE Release 7.0 with Matlab R2009bSP1 and R2010bSP1
- dSPACE Release 7.1 with Matlab R2011a
- dSPACE Release 7.2 with Matlab R2011b
- dSPACE Release 7.3 with Matlab R2012a
- dSPACE Release 7.4 with Matlab R2012a and R2012b
- dSPACE Release 2013-A with Matlab R2012a, R2012b, and R2013a

SCALEXIO

- dSPACE Release 7.4 with Matlab R2012a and R2012b
- dSPACE Release 2013-A with Matlab R2012a, R2012b, and R2013a

The selection of supported dSPACE releases focuses on releases that introduce support for a new Matlab release and dSPACE releases that introduce a new version of a cross-compiler tool. In addition, Dymola always support the three latest dSPACE releases with the three latest Matlab releases. Although not officially supported, it is likely that other combinations should work as well.

Compatibility – xPC Target

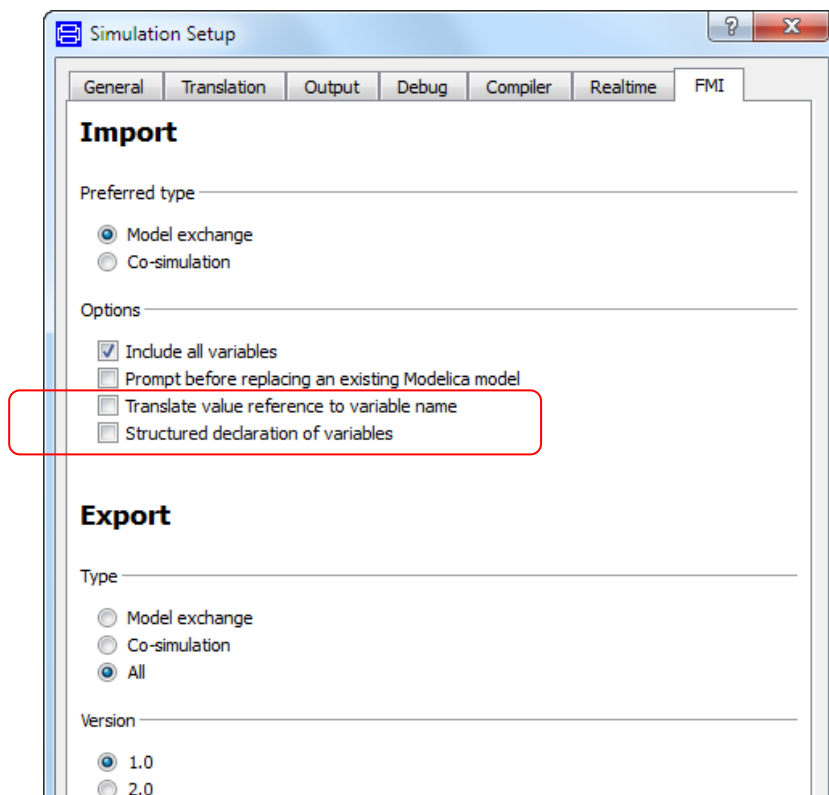
Compatibility with Matlab xPC Target has been verified for all Matlab releases that are supported by the Dymola – Simulink interface, which means R2008a (xPC Target ver. 3.4) to R2013a (xPC Target ver. 5.4). Only Microsoft Visual C compilers have been tested.

3.5.3 FMI Support in Dymola

FMU import on Linux supported for FMI

FMU import on Linux is now supported for FMI, both Model Exchange and Co-Simulation.

Additional options for FMU import



The FMI tab is reached by the command **Simulation > Setup...**, then selecting the FMI tab.

Translate value reference to variable name

By ticking this option the imported FMU will contain a file with variable names. This is useful for debugging, but may affect the performance. With this option selected, value references will be mapped to variable names in the FMU log messages.

The option is by default not applied.

Structured declaration of variables

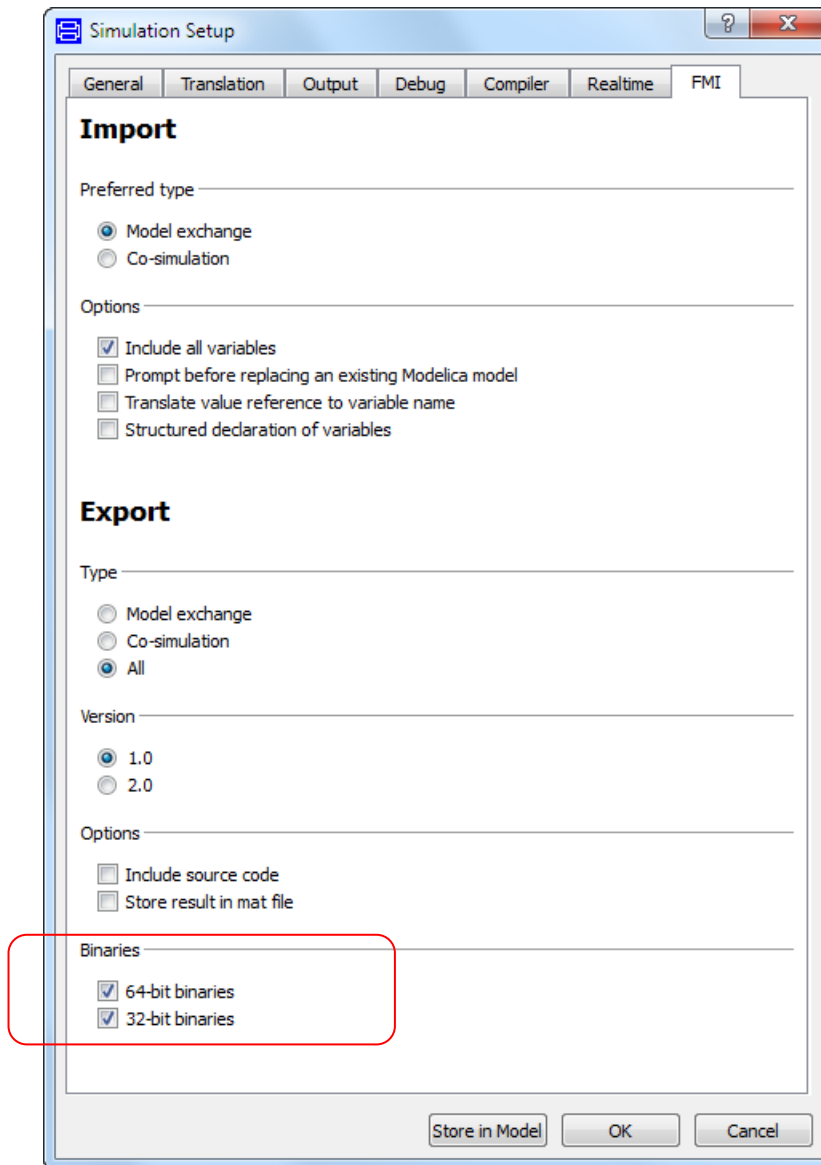
To be able to use this option, the attribute `variableNamingConvention` in the model description file of the FMU to be imported must be set to `variableNamingConvention="structured"`.

By ticking this option the variables of the imported FMU will be presented in a hierarchical structure (using record declarations). This is useful when e.g. wanting to change parameter values or access variables in the variable browser after a simulation.

The option is by default not applied.

Selectable creation of 32- and 64-bit binaries on FMU export

Dymola now supports configuring whether 32- and/or 64-bit binaries should be generated for FMU export. This setting is available in the FMI Tab, reached by the command **Simulation > Setup...**, the FMI tab:



Note that even if the option **64-bit binaries** is selected, no such binaries are created unless 64-bit compilation is enabled. In a 32-bit version of Dymola, this can be enabled by setting the flag

```
Advanced.CompileWith64=2;
```

The selection of binaries is disabled on Linux, where only 32-bit binaries are supported.

Fixed-step embedded solvers supported for FMU Co-Simulation export

The Dymola inline integration solvers are now supported also for FMU Co-Simulation export. Note that the fixed step-size used for the inline integration should also be used as step-size when calling the `fmiDoStep` routine of the generated FMU.

For source code export it is also required to set the flag

```
#define ONLY_INCLUDE_INLINE_INTEGRATION
```

in the header file `conf.h`.

Support for FMI 2.0 Release Candidate 1 (LA)

Dymola 2014 FD01 supports FMI 2.0 RC1 (Release Candidate 1) that was published on October 18, 2013.

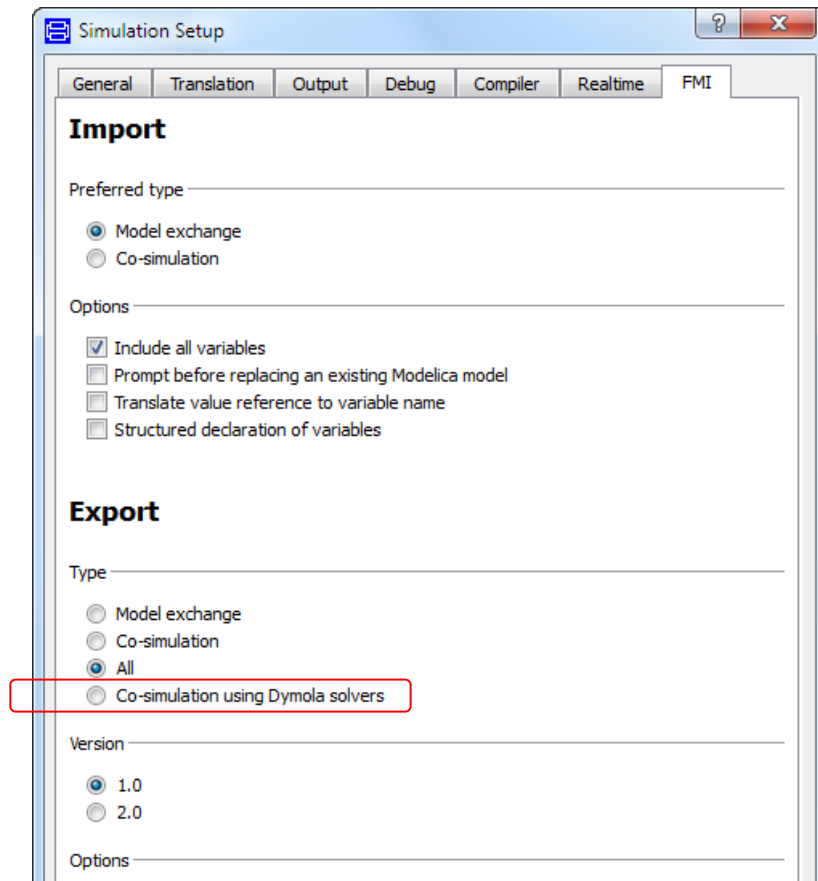
The Dymola implementation has only been tested with Dymola FMU export and Dymola FMU import, due to no availability of other implementations of FMI 2.0 RC1. No cross-checking or compliance testing was possible before the code freeze for Dymola 2014 FD01.

Note that the non-compatible FMI 2.0 Beta 4 specification is no longer supported.

For information about limitations and the latest status concerning supported features of FMI, please see www.Dymola.com/FMI.

All Dymola solvers supported for FMU version 1.0 Co-Simulation export (LA)

This Limited Availability feature is activated by setting the flag `Advanced.FMI.EnableCoSimSolvers=true`. By doing that, an additional option for export is available in the FMI tab:



By ticking this option, the solver that is selected in Dymola will also be used by the exported FMU.

Minor improvements for FMI version 1.0

- Exported FMUs from Dymola support intermediate results for event update (fmiEventUpdate) in FMI 1.0 Model Exchange.
- ASCII characters of values larger than 32 are now supported by the FMU import.

3.6 Advanced Modelica Support

3.6.1 New Java interface for Dymola (LA)

A new Java interface for Dymola is available in Dymola 2014 FD01, containing a number of functions to perform operations such as simulating, setting variables, plotting, and exporting data. For more information about this feature, please see the document “Introduction to the Java interface for Dymola.pdf” available in the distribution, in Program Files (x86)\Dymola 2014 FD01\Documentation.

The old version of Java interface is still available.

3.6.2 Support of new initialization rules in Modelica

The Modelica Standard Library 3.2.1 supports the new initialization rules in the Modelica Language Specification Version 3.2 Revision 2, section 8.6. In particular, the item (2) states:

“For all non-discrete (that is continuous-time) Real variables v_c , the equation $\text{pre}(v_c) = v_c$ is added to the initialization equations. *[If $\text{pre}(v_c)$ is not present in the flattened model, a tool may choose not to introduce this equation, or if it was introduced it can eliminate it (to avoid the introduction of many dummy variables $\text{pre}(v_c)$).]*”

Note that a real variable is discrete if it is assigned in a when clause.

In some models the new initialization rules might cause initialization to be over-determined. The old behavior in Dymola can be retained by setting the flag

```
Advanced.NewInitializationOfPre=false;
```

(The full Modelica Language Specification Version 3.2 Revision 2 can be downloaded from www.modelica.org.)

3.7 New libraries

3.7.1 Fuel Cell Library

The Fuel Cell Library is well suited for component and system design, analysis and optimization of fuel cells and fuel cell systems of various types.

The library contains a large number of generic components for modeling of pre-reforming reactors and fuel cell stacks as well as predefined configurations for easy simulation of Solid Oxide (SOFC) and Proton Exchange Membrane (PEMFC) fuel cells.

Some highlights:

- Well suited for system and component design.
- May be used in any fuel cell application domain.
- Easy to adapt stack and reactor templates to new structures.

- Solid oxide fuel cells (SOFC) and Proton exchange membrane fuel cells (PEMFC) in the same tool.
- Predefined reactors for fuel pre-processing and internal stack reforming.
- Reactions calculated by various approaches.
- Handles reformat and other ideal gas mixtures.
- Support for condensation.

The library demands a license.

3.7.2 Heat Exchanger Library

The new Heat Exchanger Library is targeted to heat exchanger design, dimensioning and stacking. The library contains flat tube heat exchanger models supporting several flat tube and louvered fin designs. The models accounts for effects of inhomogeneous air flow and temperature distribution and it is possible to model heat exchanger stacking along the flow path.

The library is suitable for studying the effects of heat exchanger dimensioning and positioning on cooling performance. The library has a native interface to the Liquid Cooling Library for complete thermal management design. The models can be coupled to Computational fluid dynamics (CFD)-derived boundary conditions on the air side, bridging the gap between CFD and system simulations.

The main focus is modeling of radiators and stacks in automotive applications.

Highlight features of the library are:

- Geometry based heat exchanger models for system simulations.
- Friction and heat transfer models for louvered fin designs.
- Captures effects of inhomogeneously distributed inlet air flow.
- Coupling to Computational fluid dynamics (CFD) data.
- Modeling of heat exchanger stacks with different heat exchanger geometries, sizes and positioning.

The library demands a license.

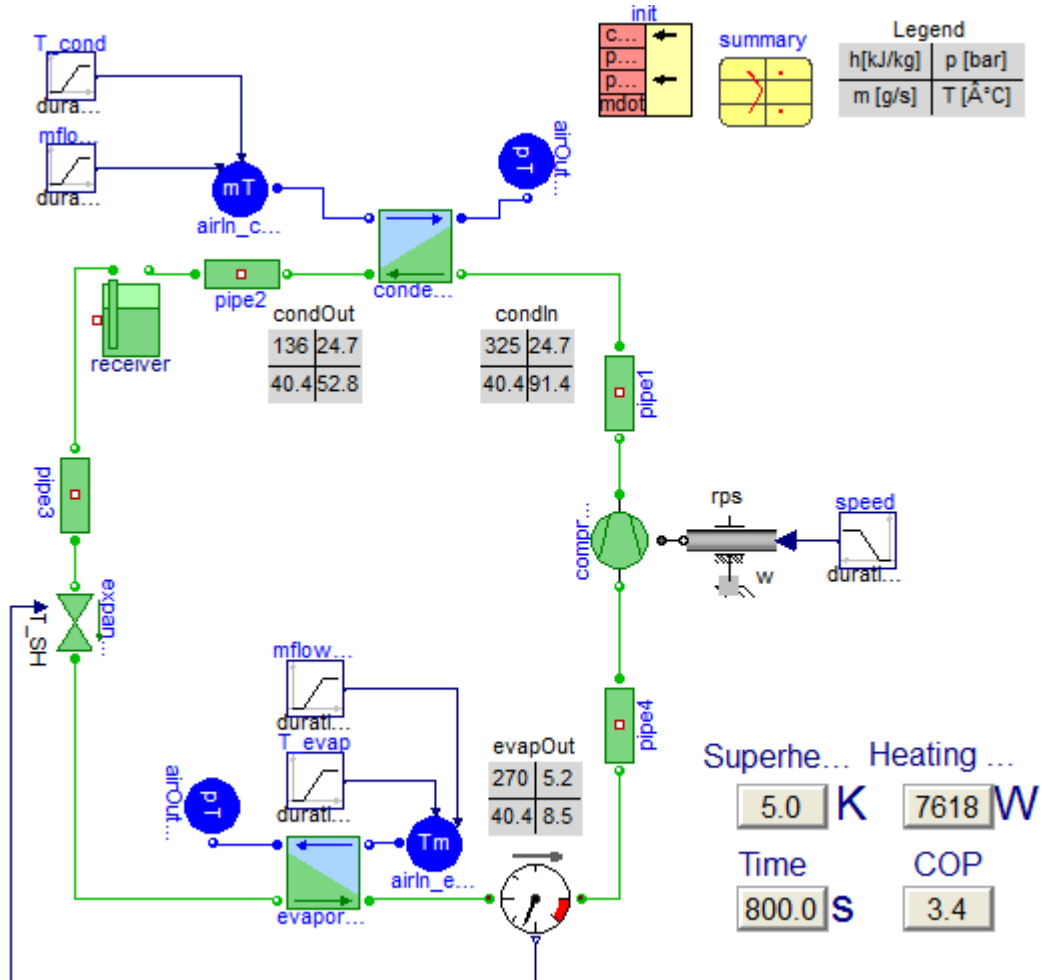
3.7.3 Modelica_DeviceDrivers

The Modelica_DeviceDrivers Library allows accessing some external devices in Modelica models. Such external devices are input devices, communication devices, shared memory, analog-digital converters and else. This is achieved by using the Modelica external C interface to call the appropriate C driver functions provided by the underlying operating system. Currently Microsoft Windows and Linux are supported.

This Modelica package is free software.

3.7.4 Vapor Cycle Library

The Vapor Cycle Library is targeted at thermodynamic systems that include a phase change of the working fluid, such as vapor compression cycles and organic rankine cycles. It is suitable for a wide range of applications in among others automotive, industrial equipment, and process industry. Applications include mobile and residential air conditioning, industrial refrigeration as well as heat pump systems.



The library contains all components necessary to build a vapor-compression thermodynamic cycle with the possibility to select from a wide range of refrigerants and other potential working fluids. Heat exchangers form the interface to other fluid domains, such as air flow and liquid coolants. Those are then covered in more detail by other libraries, such as the Liquid Cooling Library.

Main features:

- A wide range of working fluids.
- Two- and one-phase fluid flow with a choice of different heat transfer and pressure loss correlations that also covers phase change.
- Ready-to use component models with example parameterization as well as interfaces and templates for user-specific modifications.
- System examples that demonstrate the use of the library.

Limitations in this release:

- Some component models for organic rankine systems, namely pumps and expanders, are still missing and planned to be included in the next version.
- Air is currently the only available gas in heat exchangers. Additional gaseous fluids will be included in future releases.
- Heat exchangers are limited to simple but generic types. Detailed models based on geometry data, which also accept inhomogeneous air inlet distributions, are under development in the Heat Exchanger Library with the purpose to make them compatible with the Vapor Cycle Library.

The library demands a license.

3.8 Updated libraries

All libraries are compliant with Modelica Standard Library 3.2.1. If this is the only new feature in a library below, it is noted in brackets.

3.8.1 Modelica Standard Library (MSL)

A minor version, 3.2.1, has been released, with major emphasis on quality improvement and tool compatibility. The improvements include:

- More efficient handling of tables, including differentiated table outputs, support for new binary Matlab formats, and new options for parameter Smoothness and Extrapolation.
- Icons redesign.
- 60 models and blocks and 90 functions newly included.

Version 3.2.1 is backward compatible to version 3.2, that is, models developed with version 3.0, 3.0.1, 3.1, or 3.2 will work without any changes with version 3.2.1.

The Dymola 2014 FD01 distribution contains two versions of Modelica Standard Library (MSL):

- Version 3.2.1, released 2013-08-14 (build 2).
- Version 3.2, released in October, 2010 (build 9).

MSL 3.2.1 is default in Dymola 2014 FD01. If the user wants to use MSL 3.2 this can be selected using the command **Edit > Options...**, selecting the **Versions** tab.

Note! If the new version MSL 3.2.1 should be used as default version when opening models that are presently using MSL 3.2 or older, do the following:

- Apply the command **Edit > Options...**, select the **Versions** tab, select Modelica version 3.2.1 and tick **Force upgrade of models to this version**.
- Save the above setting by selecting the tab **Save Settings**, tick **Default Modelica version**, and click **OK** to save the default version.

Note! New initialization rules are applied. They can be disabled using a flag if needed. See section “Support of new initialization rules in Modelica” on page 34 for more information.

3.8.2 Air Conditioning Library

A minor version 1.8.6 has been released. Features:

- Low/zero-flow receiver outlet refrigerant properties improved.
- Activated headers are taken into account for e.g. enthalpies and pressures.
- Variability for some conversion factors improved.

User models build by version 1.8.4 and 1.8.5 require no conversion.

Note that this new version 1.8.6 is not backward compatible with Modelica Standard Library 3.2. If Modelica Standard Library 3.2 should be used, please use Air Conditioning Library version 1.8.5 – that version contains the same features as 1.8.6 except the support for Modelica Standard Library 3.2.1.

3.8.3 Electric Power Library

The new version 2.1 is a minor version containing minor modifications.

3.8.4 Engine Dynamics Library

Version 1.2 of the Engine Dynamics Library is a major update. Examples of new features and improvements:

New components added:

- Discretized pipe models for air and exhaust in `Engines.Pipes` package.
- Lumped heat exchanger models based on the eps-NTU approach.
- The available heat exchanger models have been extended to air-liquid and air-air variants, in addition to the exhaust – liquid configuration.

Examples of other improvements:

- Improvements in the medium packages.
- Static head can be accounted for by the different pipe models.

User models based on version 1.1 can be converted by the included conversion script.

3.8.5 Flexible Bodies Library

In the new version 2.1 a new subpackage `./MovingLoad` has been introduced in which extended versions of the `Beam` and `ModalBody` class are presented. They provide the capability of representing flexible bodies to which moving non-inertial or inertial loads are attached, i. e. the load attachment point of the load forces is not constant but may change during simulation.

3.8.6 Hydraulics Library

A minor version 3.3.3 has been released. Some features compared with the version 3.3.1 in previous Dymola release:

- New types for absolute pressure.
- Improved power steering example.
- A hydraulic damper example is added.
- Scaling improvements
- Improved cross platform compatibility.

Conversion from 3.3.1 is embedded.

3.8.7 Hydro Power Library

The version 2.3 of the Hydro Power Library is a major update containing several improvements. Some examples:

- The library is now compatible with the `Modelon.Thermofluid` library and uses a media structure based on `Modelon.Media`. The library is now dependent on the `Modelon` library.
- Connectors have been changed to be compatible with the `Modelon.ThermoFluid` library.
- The `Media` has been slightly changed.
- Improved names of connector components and better icons.
- A number of model name changes.

Models that are using Hydro Power 2.2 will automatically be converted to Hydro Power 2.3.

3.8.8 Liquid Cooling Library

Version 1.2 is a major update. Some examples of new features and improvements:

- New medium property models:
 - Motor oil, SAE grade 15W-40.
 - Jet fuel A.
 - Jet fuel A1.
 - Jet fuel B.
- Generic pipes, volumes and heat exchanger components inherit the parameter declaration from base classes in the `Modelon Base Library` to facilitate use of templates.

- Volume components with any number of connectors, utilizing vectorized connectors and automatic sizing, have been introduced.
- Improved numerical robustness and simulation performance when using aqueous solutions.
- Static head can be accounted for by the generic pipe models and geometric models of straight pipes.
- Added an experiment template model that defines a replaceable medium model, an aggregate volume component and experiment icon.
- Added heat exchanger test bench templates with replaceable components and boundary conditions.

A provided conversion script can perform all required conversion of user models.

3.8.9 Modelica_LinearSystems2

A minor version 2.3.1 has been released, with minor improvements. It is backward compatible with the previous version 2.3.

3.8.10 Modelica_StateGraph2

(The new minor version 2.0.2 is compliant with Modelica Standard Library 3.2.1.)

3.8.11 Modelica_Synchronous Library

A minor version 0.92 has been released. Some features:

- A couple of convenience source blocks added, having as output a clocked signal.
- A couple of source blocks added, that are parameterized in terms of clock ticks rather than simulation time.
- All new blocks are now utilized in at least one test.

3.8.12 Optimization Library

(The new minor version 2.2.1 is compliant with Modelica Standard Library 3.2.1.)

3.8.13 Pneumatics Library

A minor version 1.6.1 has been released.

3.8.14 PowerTrain Library

A minor version 2.1.1 has been released. Some features:

- Additional initialization parameters in a number of modules.
- Improved initialization of all examples so that the initial conditions are defined consistently.

The library is backward compatible with PowerTrain versions 2.x.

3.8.15 Smart Electric Drives Library

A minor version 1.4.4 has been released. Some features compared with the version 1.4.2 in previous Dymola release:

- Changed initialization of some blocks (version 1.4.3).
- Applied fixed parameter values to some drive models and examples for Modelica compatibility.

3.8.16 Thermal Power Library

Version 1.7 is a major update of the library. Some examples of improvements:

- Restructuring of `DynamicPipe_lumpedP` twophase model.
- New discretized twophase pipe model that can handle reversing flow.
- It is possible to use other twophase medium than `WaterIf97`, e.g. an organic medium like `rR134a`.

Models using ThermalPower 1.6 will automatically be updated to ThermalPower 1.7.

3.8.17 Vehicle Dynamics Library

Version 1.8 is a major maintenance release with a number of improvements. Some examples:

- Additional tuners, tunables and setup experiment are now available; tuners and tunables can be used to adjust many different properties of the vehicle, such as camber, toe, and ride heights. Chassis tuning/setup is applicable both in OEMs and Motorsports.
- An example of the use of the `Modelon.DataAccess` architecture for data management has been added. The example demonstrates how a vehicle model can be completely parameterized to data from external files using the `DataAccess` functionality.
- Boolean visualization modes in wheels have been modified to be `Reals`, in order to improve real-time performance.
- The Tabular engine and its torque block have been restructured to make it easier to add custom engine torque models.
- The parameter and input connectors to the `ShakerN` and `PivotingPlanes` ground models have been changed to get consistency and improved usability. The port locations and input connector index now corresponds directly to the `wheel_number`.

A conversion script is available to convert models build with version 1.6, 1.7, and 1.7.1 to version 1.8.

3.8.18 Vehicle Interfaces Library

(The new minor version 1.2.1 is compliant with Modelica Standard Library 3.2.1.)

3.9 Documentation

In the software distribution of Dymola 2014 FD01 Dymola User Manuals of version “September 2013” will be present; these manuals include all relevant features/improvements of Dymola 2014 FD01 presented in the Release notes. Limited Availability (LA) features are not included, except some limited documentation of FMI 2.0 RC1.